Personalized Health Care - Education

Canadian Academy of Health Sciences

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Questions:

- 1) What are pharmacy organizations and schools doing to educate pharmacy students, trainees, and pharmacist practitioners about Personalized Health Care?
- 2) What and how should we be teaching the public and health professionals about Personalized Health Care as it relates to:
  - role of new drugs?
  - new roles of old drugs?

American Association of Colleges of Pharmacy (AACP) Academic Affairs Committee (2002)

- **Competencies in Pharmacogenetics and Pharmacogenomics for Pharmacists** derived, in part, from *Core Competencies in Genetics Essential for All Health-Care Professionals,* National Coalition for Health Professional Education in Genetics (NCHPEG)
  -Genet Med 2001;3:155–9.
- **I. Genetic basis of disease**
  - **A. Knowledge**
  - **B. Skills**
  - **C. Attitudes**
- **II. Drug discovery and disposition/drug targets**
  - **A. Knowledge**
  - **B. Skills**
  - **C. Attitudes**
- **III. Ethical applications, social and economic implications**

-Am. J. Pharm. Educ. 2002;*66:12S-15S*

International Society of Pharmacogenomics (ISP) Education Forum (2004)

- Developed a 10-item list of Recommendations and Call for Action for Deans of pharmacy, medicine, and nursing faculties

- The Pharmacogenomics Journal 2005;5:221–225.

Accreditation Council for Pharmacy Education (ACPE) Accreditation Standards and Guidelines (2007)

Identified essential elements for pharmacy curricula:

- Genetic basis for disease and drug action
- Genetic basis for alteration of drug metabolism
- Genome and proteomic principles in relation to disease and drug development
- Genetic basis for individualizing drug doses
- Genetic basis for antibody synthesis, development, function, and immunopathology

-2007 ACPE Accreditation Standards and Guidelines. http://www.acpe-accredit.org/

American College of Clinical Pharmacy (ACCP) Educational Affairs Committee (2010)

- Identified four essential components of a pharmacy curriculum related to advances in genomics:

1) Personalized medicine concepts and terminology, with a focus on genomics;
2) Genomic applications in basic and applied pharmaceutical sciences;
3) Biotechnology; and
4) Bioinformatics

- For each component, the following were developed:
  - Curricular Outcome
  - Discussion
  - Suggested Implementation
  - Benchmark Performance Measures
- Unlike previous white papers and guidelines, this Committee actually provided suggestions for specific curricular changes to address each competency.
  - *Pharmacotherapy 2010;30:228e–235e*

Three recent surveys of US and Canadian pharmacy schools

Survey Question	YES	NO
Is PG content included in the curriculum?		
Latif and McKay (2005) Respondents: 41/85 US pharmacy schools (48% response rate)	78% N=32	22% N=9
Zdanowicz et al (2006) Respondents: 46/100 US and Canadian pharmacy schools (46% response rate)	87% N=40	13% N=6
Murphy et al (2010) Respondents: 75/90 US pharmacy schools (83.3% response rate)	92% N=69	8% N=6

-Latif and McKay. Am J Pharm Educ. 2005;2:Article 23.
-Zdanowicz et al. Int J Pharm Edu. 2006;2:1-12.
-Murphy et al. Am J Pharm Educ. 2010;74:Article 70.

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Three recent surveys of US and Canadian pharmacy schools (continued)

Survey Question	
Hours of PG content included in curriculum	
Latif and McKay (2005) Respondents: 41/85 US pharmacy schools (48% response rate)	-
Zdanowicz et al (2006) Respondents: 46/100 US and Canadian pharmacy schools (46% response rate)	Mean = 10.1 hours Median = 7.0 hours Std. Dev. = 7.2 hours
Murphy et al (2010) Respondents: 75/90 US pharmacy schools (83.3% response rate)	≤10 hours 40.6% (N=28) 11 to 30 hours 42.0% (N=29) 31 to 60 hours 14.5% (N=10)

-Latif and McKay. Am J Pharm Educ. 2005;2:Article 23.
-Zdanowicz et al. Int J Pharm Edu. 2006;2:1-12.
-Murphy et al. Am J Pharm Educ. 2010;74:Article 70.

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UBC Faculty of Pharmaceutical Sciences

Systems Medicine Research Stream

- "will bring together basic, clinical, and pharmacy practice researchers inside and outside the Faculty of Pharmaceutical Sciences with a common interest in developing a community dedicated to the application of pharmaceutical science and practice to the creation of personalized, proactive, predictive, and participatory patient care"
- one of the goals is: "to develop education curricula and syllabi to educate patients, pharmacists, physicians, and graduate and undergraduate students in systems medicine"

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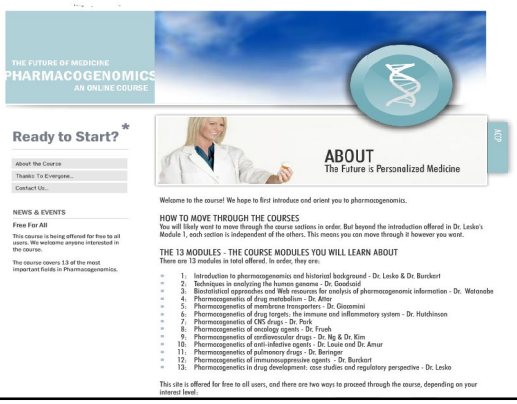
American College of Clinical Pharmacology

http://user.accp1.org/index_new.html



Pharmacogenomics Education Program: Bridging the Gap between Science and Practice" (*PharmGenEd*™) - http://pharmacogenomics.ucsd.edu/home.aspx

HEALTH CARE

This Time

It's Personal

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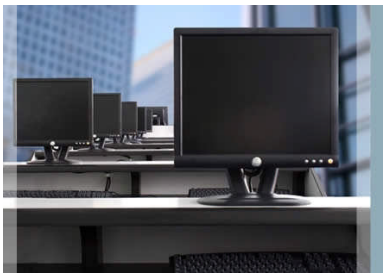
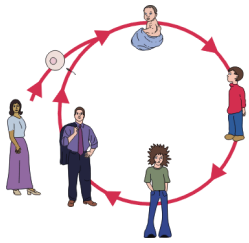
PERSONALIZED HEALTH CARE-it deserves the hype!

- Is fundamentally different
- Although in its infancy, it offers promise of being able to *personalize* medical care in preparation rather than in response
- However, at this time, unclear what that potential will be

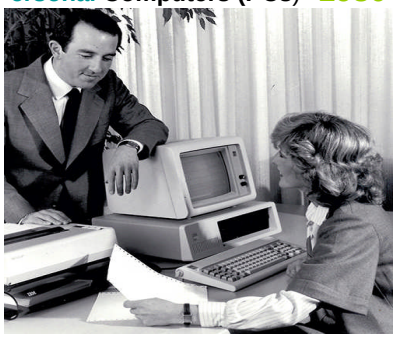
Personal Computers (PCs)



Personal Computers (PCs)

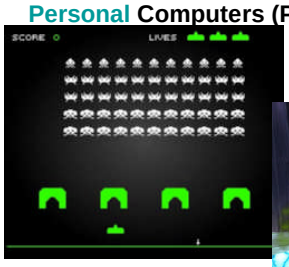


Personal Computers (PCs) 1980



Personal Computers (PCs) 2010

Personal Computers (PCs) 1980 to 2010



GAME CHANGER → PARADIGM SHIFTER

PERSONALIZED HEALTH CARE- EDUCATION

- How do we approach the education of the public and health professionals?
  - Teach tools to use Personalized Health Care in here and now
  - Simultaneously open minds to promise that will be fulfilled in future
  - Teach by way of applications and examples, not by facts (because "facts" will change)

PERSONALIZED HEALTH CARE - EDUCATION

- "WHAT IS?"

- "WHAT IF?"

What should we be teaching the public and health professionals about old drugs and new drugs, with the benefit of this 20/20 hindsight of how rapidly technology evolves?

	PUBLIC	HEALTH PROFESSIONALS
Old Drugs		
New Drugs		

	PUBLIC	HEALTH PROFESSIONALS
Old Drugs	✓	
New Drugs		

Old Drugs: PUBLIC

- High variability in effectiveness, safety, and toxicity across individuals.
- With few exceptions, do not know why that variation occurs and cannot accurately quantify it

Example: Warfarin

- Combination of *CYP2C9* and *VKORC1* genotypes, age, height, body weight, interacting drugs, and indication
- Explains ONLY ~55% of warfarin dose variability

-http://warfarindosing.org/Source/Home.aspx
-*N Engl J Med 2009;360:753-64.*

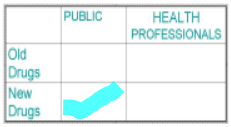
	PUBLIC	HEALTH PROFESSIONALS
Old Drugs		
New Drugs	✓	

New Drugs: PUBLIC

- As new drugs emerge, will understand more about their characteristics which will have both positive and negative impact:
- positive - they may be more effective in some patients; there may be less adverse effects in targeted populations

Example: Abacavir

- Patients with HLA-B57 mutation have higher incidence of potentially life-threatening hypersensitivity reaction
- New labelling for abacavir recommends genetic test to screen patients for potential interaction



New Drugs: PUBLIC

(continued)

- negative
- As we become increasingly effective at sub-typing diseases and mechanisms of actions of drugs, we will be telling patients:
- "Some drugs may not be suitable for you" (i.e., there may be less hope)
- "Your cholesterol-lowering agent could be highly effective in 70% of the patients, but we're not even going to start the drug in 30% of the patients because the risk-benefit ratio is poor"

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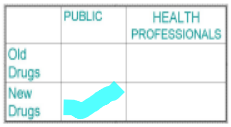

New Drugs: PUBLIC

(continued)

- Educate the public on how drug therapy is going to be increasingly individualized and give weight to discouraging practices (e.g., sharing medications)
- What has been easy to explain (i.e., "don't use your friend's antibiotic because they may have a different infection") may be extended to all drugs
- Population data will be much less relevant

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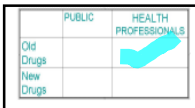

Old Drugs: Health Professionals

(continued)

- Historically, vast majority of information has focused on new drugs
- Once health professionals have gained experience with old drugs, did not have too much more to learn
- Have to convince practitioners to learn new things about old drugs that they thought they already knew everything about!

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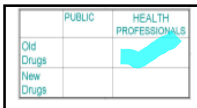

Old Drugs: Health Professionals

(continued)

- Have new rapidly evolving body of information to help improve selectivity and specificity of therapeutic approaches
- For example, in recent years, revised labelling for several existing drugs to include information on genetic variants linked to adverse drug effects or drug efficacy
- (e.g., irinotecan, 6-mercaptopurine, carbamazepine, phenytoin, clopidogrel, and warfarin, abacavir, etc.)

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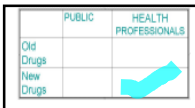

New Drugs: Health Professionals

- Need to teach general principles while both acknowledging and preparing health professionals for a world in which those principles are going to change
- New drugs for which practitioners' experiences and body of information are evolving rapidly

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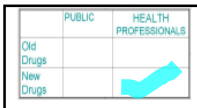

New Drugs: Health Professionals

(continued)

Paradigm Shift

- PAST and CURRENT ERA:
  Trial and Error ("Reactive testing")
- FUTURE ERA:
  Fewer Trials and Less Error ("Proactive testing")

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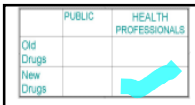

New Drugs: Health Professionals

(continued)

Paradigm Shift

Examples:

- **NNT**
- **Patients' prior knowledge**

·Patients are no longer subordinate, passive recipients of physician-initiated genetic testing; rather, patients can instigate their own testing and often know more than their clinicians about particular genetic topics. Indeed, health care providers are increasingly bypassed altogether, as patients embrace direct-to-consumer (DTC) genetic tests and turn to social networks for help in interpreting their results." *-Evans JP et al. 10.1056/nejmp1006202 nejm.org -*

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PERSONALIZED HEALTH CARE- EDUCATION

	PUBLIC	HEALTH PROFESSIONALS	HEALTH SCIENTISTS
Old Drugs			✓
New Drugs			✓

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Health Scientists

- Engage health scientists to invest time and energies in elucidating mechanisms and relationships that have to date eluded us
- Will require data sharing in an unprecedented manner as in Alzheimer's Disease Neuroimaging Initiative
  - In 2004: NIH, FDA, pharmaceutical and medical-imaging industries, universities and nonprofit groups collaborated on project to find biological markers that show progression of Alzheimer's disease
  - Unprecedented sharing of all data - every finding publicly available immediately to anyone anywhere in world
  - To date, >3,200 downloads of entire huge dataset and almost one million downloads of datasets of images from brain scans.

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Health Scientists (continued)

- Need to get past the traditional secrecy and commit to a free and open sharing of information
- People used to say that "Information is power"
- But, the Internet changed that to:

"Power comes out of sharing information, not holding it."

Example: Project Gutenberg

- Founded in 1971, has taken books no longer copyrighted and put them on line for free
- Is the oldest digital library (most items are full texts of public domain books, made as free as possible in long-lasting, open formats that can be used on almost any computer)
- As of December 2009, Project Gutenberg claimed >32,000 items in its collection

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Health Scientists (continued)

- Need to imagine: 1) Direct application of a single piece of information and 2) Integration of multiple sources of information
- Through the power of networking, we can bring new meaning to old information!
- Example: Michael Hayden and Bruce Carleton's Genotype-Specific Approaches to Therapy in Childhood [GATC] Research Program
  - Using two unique Canada-wide surveillance networks, clinicians and scientists have collected an enormous amount of information
    - not just for analysis in the here and now,
    - but also in anticipation of technology advances to better interpret the information in the future

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Questions:

For Personalized Health Care:

We need to anticipate the volume, complexity, and variability of the information and imagine:

- How will we create the Wikipedia of Personalized Health Care and ensure that the content is complete and accurate?
- How will we create the Google for Personalized Health Care and ensure that the results are selective, specific, and relevant?

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